



(11) Publication number : **0 528 571 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **92307038.7**

(51) Int. Cl.⁵ : **A47L 15/42**

(22) Date of filing : **03.08.92**

(30) Priority : **19.08.91 US 747046**

(43) Date of publication of application :
24.02.93 Bulletin 93/08

(84) Designated Contracting States :
DE FR GB IT SE

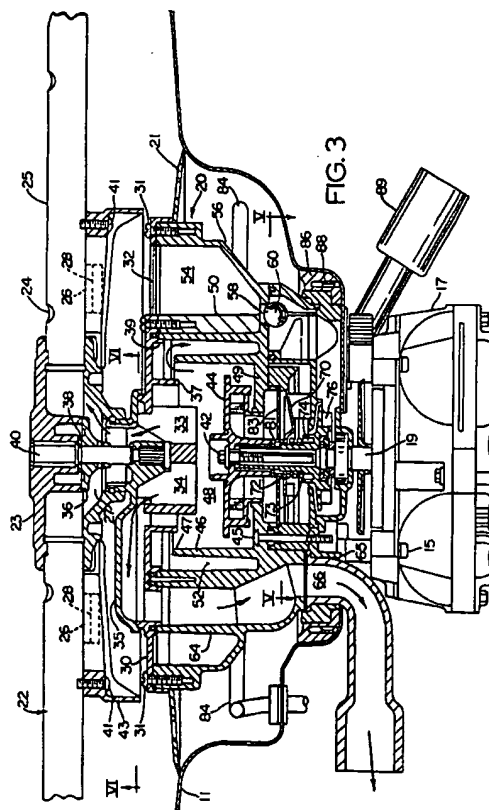
(71) Applicant : **WHIRLPOOL CORPORATION**
2000 M-63
Benton Harbor Michigan 49022 (US)

(72) Inventor : **Meyers, Theodore F.**
3205 Magnolia Drive
Troy, Ohio 45373 (US)

(74) Representative : **Williams, Trevor John**
J.A. KEMP & CO. 14 South Square Gray's Inn
London WC1R 5LX (GB)

(54) **Soil separator for a domestic dishwasher.**

(57) A combination motor-pump and soil separator (20) assembly includes a reversible motor (17) which drives a wash pump and a drain pump. When operated in a wash mode, the wash pump directs pressurized wash liquid to one or more wash arms (22). In addition, a centrifugally sampled portion of the wash liquid containing a high concentration of entrained soil particles is directed to a guide chamber (52). The guide chamber (52) is in fluid communication with a soil container (54), which receives the wash liquid to be treated. Soil-laden water received within the soil container (54) is passed through fine filters disposed in a wall of the soil container (54), resulting in a cleansed wash liquid. The cleansed wash liquid is then returned to the wash pump, where additional wash liquid is added, for recirculation within the dishwasher. Upon completion of a wash cycle, the motor (17) is operated in the opposite direction, providing a draining action within the soil collector.



EP 0 528 571 A1

BEST AVAILABLE COPY

BACKGROUND OF THE INVENTION

The present invention is directed to a soil separator for a dishwasher and particularly to a centrifugal soil separator incorporating a fine filter for removing soil particles of varying specific gravities and sizes from wash liquid within the dishwasher.

The use of a centrifugal soil separator in conjunction with a motor-driven pump in a dishwasher is known. Such a soil separator is shown in U.S. Patent No. 4,319,599, Dingler et al., for example. A motor is typically mounted to a combination pump and soil separator assembly, which in turn provides wash liquid to one or more wash arms within the dishwasher cavity. In operation, the motor-driven pump draws wash liquid from the floor of the dishwasher cavity, pumping a majority of the wash liquid through the wash arms into the dishwasher cavity. A soil-laden, centrifugally sampled portion of the wash liquid is diverted to a sealed accumulator chamber for settling of heavy soils. A stand pipe extending from the bottom of the accumulator chamber permits surface liquid within the accumulator to return to pump inlet, thereby providing recirculation of cleansed wash liquid within the dishwasher.

A problem associated with such a design is that pressure within the sealed accumulator chamber limits the rate of wash liquid flow into and through the accumulator chamber. Pressure within the chamber may be expected to be approximately 6 1/2 PSI, resulting in a flow rate through the accumulator chamber of approximately 1/2 gallon per minute. As a result, during a single wash cycle, the total flow of wash liquid through the accumulator chamber is limited, thereby reducing the system's soil removal effectiveness.

Another disadvantage associated with such a design is its relative inability to remove soil particles having a specific gravity less than one from the wash liquid, due to the fact that floating particles within the accumulator chamber are permitted to return to circulation by means of the standpipe. Yet another disadvantage associated with such a design is the requirement of a complex spring-loaded check valve for sealing the accumulator chamber.

In U.S. Patent No. 4,392,891, Meyers, a dishwasher includes a combination soil collector and motor-driven pump. In a wash cycle, the motor-driven pump directs a majority of wash liquid circulated thereby to one or more wash arms, which in turn distribute wash liquid within the dishwasher wash cavity. The remainder of the wash liquid is diverted to a soil collecting circuit which circulates wash liquid to a soil collector. The soil collector includes a filter for filtering food soil from fluid passing therethrough and holds the soil for discharge into the dishwasher drain system.

A disadvantage associated with such a design is

its relative inefficiency compared to a centrifugally sampling soil separator, in that a random sample of the wash liquid necessarily contains a lower concentration of entrained soil compared to a centrifugally sampled portion. Therefore, despite a relatively high flow rate resulting from the fact that the soil collector chamber is open to atmospheric pressure, soil is removed from circulation at less than an ideal rate.

SUMMARY OF THE INVENTION

In accordance with the present invention, the disadvantages of the prior art dishwasher soil separators have been overcome. A dishwasher soil separator constructed in accordance with the present invention includes a combination motor-pump and soil separator assembly having a lower wash arm assembly disposed thereon. The motor-pump assembly includes a wash impeller, which operates within a pump cavity located within the soil separator. The pump cavity is defined by an annular interior wall in combination with a lower housing wall. As the impeller operates in a wash or rinse mode, a swirling motion is created in the wash liquid-passing through the pump cavity, thereby creating a centrifugally sampled annular layer of wash liquid on the annular interior wall. This portion of the wash liquid, having a high concentration of entrained soil, passes over an upper edge of the annular interior wall and into an annular guide chamber.

The wash liquid then travels from the annular guide chamber to an annular soil container chamber, at a high flow rate heretofore unknown in a centrifugal-type soil separator. This high flow rate is achieved by use of a relatively small aperture located in a lower portion of the annular wall separating the guide chamber and the soil container chamber, with the soil container chamber being open to atmospheric pressure. Use of a relatively small aperture also minimizes pressure loss within the pump cavity, which in turn maximizes pressure to the wash arm assembly. The high flow rate of soil-laden wash liquid into the soil collection chamber also accomplishes the desirable result of maximizing flow through the soil collector chamber, which increases the likelihood an individual soil particle will be rapidly removed from circulation within the dishwasher.

Upon entering the soil collection chamber, wash liquid flows outwardly and upwardly therein, and is prevented from draining out of a soil container drain port by a ball check valve seated within the drain port. Wash liquid is permitted to flow freely upwardly, due to the low effective pressure within the soil container chamber. When the level of wash liquid reaches the top of the soil container chamber, cleansed wash liquid is permitted to flow out of the soil container chamber through the soil separator cover. The soil separator cover contains an annular arrangement of fine

mesh filters, which prevent soil particles entrained in the wash liquid from reentering the dishwasher space. Cleansed wash liquid emitted from the soil container chamber in this fashion drains to the dishwasher floor, where it is picked up by the motor-driven pump for recirculation within the dishwasher.

Further in accordance with the present invention, the wash arm assembly includes a filter guard for protecting the fine mesh filters from damage caused by falling objects such as tableware. A downwardly directed nozzle in each of the lower wash arms directs a spray of wash liquid downwardly from the wash arm assembly. The spray impinges a deflector tab mounted on the filter guard, providing a downwardly directed fan-shaped spray of wash liquid. As the wash arm assembly rotates, each of the nozzles describes an arcuate path corresponding to the annular arrangement of fine mesh filters located in the soil separator cover. A backflushing action within the fine mesh filters is created, preventing the filters from becoming clogged by accumulated soil particles.

An object of the invention is to provide a soil removal system in a dishwasher that rapidly removes entrained soil particles from the wash liquid.

Another object of the invention is to provide a soil removal system that rapidly removes both heavy and light entrained soil particles from the wash liquid.

Yet another object of the invention is to provide a soil removal system that rapidly removes both heavy and light entrained soil particles of varying sizes from the wash liquid, while minimizing pressure loss to the wash arm assembly resulting from the soil removal process.

Yet a further object of the invention is to provide a soil removal system that is both economical to manufacture and reliable in use.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a dishwasher including a soil separator in accordance with the present invention;

FIG. 2 is a plan view of the soil separator having the wash arm assembly removed therefrom and with a portion of the soil separator screen cut away;

FIG. 3 is a diametric section of the soil separator including the wash arm assembly, taken along line III-III of FIG. 2;

FIG. 4 is an elevational view of a portion of an interior wall of the soil separator of FIG. 2 shown along line IV-IV;

FIG. 5 is an enlarged transverse section taken substantially along line V-V of FIG. 3;

FIG. 6 is a partially cut away bottom view of the wash arm assembly and screen cover shown in FIG. 3 along line VI-VI; and

FIG. 7 is an enlarged section of the wash arm and

the screen cover shown in FIG. 6 taken along line VII-VII.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the invention as shown in the drawings, and particularly as shown in FIG. 1, an automatic dishwasher generally designated 10 includes an interior tank wall 12 defining a dishwashing space 14. A soil separator 20 is centrally located in floor 11 and has a lower wash arm assembly 22 extending from an upper portion thereof. Coarse particle grate 21 permits wash liquid to flow from floor 11 to soil separator 20, while preventing foreign objects, such as apricot pits and pop tops, from inadvertently entering soil separator 20.

Referring now to FIG. 3, the soil separator and pump assembly generally comprises a motor 17 having an output shaft 19 secured to base plate 65 by bolts 15. The motor 17 is a reversing motor which normally operates in a clockwise direction, as viewed in FIG. 2. When operated in a clockwise direction, such as in a wash mode or a rinse mode, the motor 17 provides a pumping action within soil separator 20, thereby providing pressurized wash liquid to lower wash arm assembly 22.

Lower wash arm assembly 22 includes a central hub 23 having a plurality of wash arms 25 extending radially therefrom. Each wash arm 25 includes one or more upwardly directed spray nozzles 24 for directing wash liquid upwardly within dishwashing space 14, and one downwardly directed spray nozzle 26 for providing a back-washing action, as will become apparent. Each downwardly directed spray nozzle 26 has a deflector tab 28 disposed immediately adjacent thereto, for providing a dispersed fan-shaped spray, as will be fully discussed hereinafter. Liquid passage-way 27 in central hub 23 permits pressurized wash liquid to flow to the lower wash arm assembly 22.

As shown in Fig. 2, the soil separator 20 further includes an annular cover 30 which is disposed over and secured to soil container wall 56 by screws 31. When in place, cover 30 and soil container wall 56 combine to form a low-pressure water seal, preventing leakage of water therebetween. Cover 30 includes a series of fine mesh filter segments 32 which are radially disposed about a central axis of the cover. Fine mesh filter segments 32 are preferably formed of a synthetic material such as nylon or polyester and have a mesh on the order of .0049" to .0106". Depending on the material desired to be filtered, however, a larger or smaller mesh filter may be used.

Located radially inwardly from the fine mesh filter segments 32 and depending downwardly from cover 30 is an annular lip 39. Annular lip 39 forms a high-pressure seal in combination with upstanding wall 50, as will become apparent. An upper wash arm feed

channel 35 is disposed on top of cover 30, providing a continuous flow path for transporting pressurized wash liquid from the impeller 44, through upper wash arm feed tube 64, downwardly to conduit 66 and to the upper wash arm (not shown).

Further located radially inwardly from the annular lip 39 of cover 30 is a downwardly depending annular wall 37. Annular wall 37 defines a centrally located interior area containing a plurality of vanes for directing pressurized wash liquid. Lower wash arm feed vanes 33 direct a first portion of the pressurized wash liquid through liquid passageway 27 to wash arms 25. Corresponding upper wash arm feed vanes 34 direct a second portion of the pressurized wash liquid to upper wash arm feed channel 35. Extending upwardly at the central axis of the cover is a fixed spindle 40.

Bushing 36 is mounted on spindle 40 by any appropriate conventional means, such as a drift pin. Washer 38 is supported by bushing 36, providing a low-friction support for lower wash arm assembly 22.

Referring now to FIG. 3, it may be seen that lower wash arm assembly 22 is freely rotatably mounted about its central axis on spindle 40. As shown in FIGS. 3 and 6, filter guard 43 is mounted to wash arms 25 by screws 41. Filter guard 43 overlies the fine mesh filter segments 32 of cover 30, protecting fine mesh filter segments 32 from damage caused by falling utensils or tableware. In operation, pressurized wash liquid flows past bushing 36 into wash arms 25. Upwardly directed nozzles 24 are positioned on wash arms 25 so as to provide a chordally directed thrust, causing lower wash arm assembly 22 to rotate about spindle 40 when pressurized wash liquid is pumped through nozzles 24.

As lower wash arm assembly 22 rotates, pressurized wash liquid is emitted from downwardly directed nozzles 26. As shown in FIGS. 6 and 7, a deflector tab 28 integrally formed as part of filter guard 43 is disposed directly beneath each nozzle 26, impinging on the flow of wash liquid emitted therefrom. As the flow of water from each nozzle 26 strikes the associated deflector tab 28, a fan-shaped spray is formed. Each fan-shaped spray sweeps the top of the fine mesh filter segments 32 as lower wash arm assembly 22 rotates, thereby providing a backwashing action to keep fine mesh filter segments 32 clear of soil particles which may impede the flow of cleansed wash liquid into dishwashing space 14.

Soil separator 20 also includes a wash impeller 44, located within pump cavity 48. Pump cavity 48 is generally defined by the soil separator lower housing wall 49, a first upstanding annular wall 46, and cover 30. Screws 45 passing through lower housing wall 49 within pump cavity 48 secure soil separator 20 to base plate 65.

Wash impeller 44 is secured to the output shaft 19 of pump motor 17 by impeller retaining bolt 42, and pumps wash liquid at the rate of approximately 40 gal-

lons per minute when in operation. The majority of the pressurized wash liquid enters the area beneath the cover 30 defined by downwardly depending annular wall 37, and is divided and directed by lower wash arm feed vanes 33 and upper wash arm feed vanes 34. Under normal operating conditions, flow of pressurized wash liquid is provided to the lower wash arm at the approximate rate of 28 gallons per minute, and to the upper wash arm at the approximate rate of 8 gallons per minute.

During normal operation, a third portion of the wash liquid is maintained within the soil separator to be cleansed and returned to circulation. In pump cavity 48, a portion of the wash liquid having a high concentration of entrained soil tends to accumulate on a first upstanding annular wall 46. The swirling motion of the liquid tends to carry the soil upwardly over the upper edge 47 of wall 46, whereupon the soil-laden liquid collects within annular guide chamber 52 defined between first upstanding annular wall 46 and second upstanding annular wall 50. Undesirable pressure loss within the annular guide chamber 52 is prevented by forming a relatively water-tight, high pressure seal at the juncture of cover 30 and second upstanding annular wall 50.

As shown in FIG. 4, an aperture 51 provides an opening between the second annular guide chamber 52 and a soil container chamber 54, permitting soil entrained wash liquid to flow therethrough. Under normal operating conditions, wash liquid flows through aperture 51 at the rate of approximately 4 gallons per minute. Aperture 51 is advantageously formed in the lower portion of the annular wall 50, permitting substantially complete draining of annular guide chamber 52. In one embodiment, shown in FIG. 4, aperture 51 has a trapezoidal-shaped horizontal cross-section which expands outwardly from annular guide chamber 52 to soil container chamber 54.

Soil container chamber 54 is generally defined by lower housing wall 49, soil container wall 56, second upstanding annular wall 50 and cover 30. As soil-entrained wash liquid flows from annular guide chamber 52, the liquid level in soil container chamber 54 rises until reaching cover 30. A portion of the soil entrained in the wash liquid settles within soil container chamber 54, particularly those heavier soil particles having a specific gravity greater than one. Lighter soils, however tend to rise within soil container chamber 54, until reaching cover 30.

Fine mesh filter segments 32 in cover 30 permit flow of cleansed wash liquid to return to dishwasher space 14 for recirculation. Light soil particles are screened by fine mesh filter segments 32 and retained in soil container chamber 54. Accordingly, both heavy and light soil particles remain within the soil container chamber while maintaining a relatively high rate of flow through the soil container chamber.

When operated in a wash or rinse mode, the dish-

washer functions as a continuous fluid circuit. In a wash mode, for example, wash liquid flows from dishwashing space 14 to dishwasher floor 11 and is gravity-fed to coarse particle grate 21. Wash liquid flows past heating unit 84 to soil separator 20, where it is drawn inwardly by negative pressure created by impeller 44. Wash liquid flows over sealing ring 86, which, in combination with floor 11 and retainer ring 88, serve to support and seal the soil separator and pump assembly within the dishwasher. Wash liquid continues to flow horizontally and inwardly over base plate 65, until encountering soft soil chopper 70.

As may best be observed in FIGS. 3 and 5, soft soil chopper 70 is located on motor shaft 19 and rotates therewith to macerate large soft soil particles which travel past grate 21. Torsion spring 72 both supports and drives chopper 70, urging chopper 70 upwardly against collar 81, which in turn is held in place on output shaft 19 by a downwardly depending shoulder of wash impeller 44. An axially extending lower end 73 of torsion spring 72 extends into a blind hole 74 in an upper shoulder of drain impeller 76. A radially extending upper portion 75 of torsion spring 72 extends into v-shaped groove 79 of radial tongue 77.

After passing soft soil chopper 70, wash liquid is drawn through grate 83 and further upwardly into pump cavity 48 by wash impeller 44. Wash impeller 44 imparts a swirling motion to the wash liquid, forcing a majority of the wash liquid upwardly to lower wash arm feed vanes 33 and upper wash arm feed vanes 34. Wash liquid sprayed from upwardly directed spray nozzles 24, downwardly directed spray nozzles 26 and cleansed wash liquid emitted from fine mesh filter segments 32 into dishwashing space 14 returns to floor 11 to be recycled.

Due to the centrifugal force acting on the swirling liquid in pump cavity 48, the remainder of the wash liquid forms a band or layer on the interior of first upstanding annular wall 46. This band of wash liquid contains a heavy concentration of entrained soil particles having a relatively high specific gravity, which tend to be forced outwardly by centrifugal force. This band of wash liquid also contains approximately the same concentration of soil particles having a relatively low specific gravity representative as the wash liquid as a whole.

As the wash liquid swirls upwardly in a clockwise direction, the concentrated soil particles accumulated on the interior of first upstanding annular wall 46 flow over the upper edge 47 with a portion of the wash liquid. Wash liquid accumulates in annular guide chamber 52, to be forced through aperture 51 in second upstanding annular wall 50, as may best be seen in FIG. 4. Due to the relatively small size of aperture 51, low pressure loss in annular guide chamber 52 and pump cavity 48 is achieved. At the same time, due to the high pressure drop from annular guide chamber 52 to soil container chamber 54, a high flow

rate through aperture 51 is achieved.

As soil-laden wash liquid flows into soil container chamber 54, its velocity is reduced, permitting heavy soil particles to collect on lower housing wall 59. As the clockwise rotation of wash impeller 44 forces soil-laden wash liquid into soil container chamber 54, clockwise rotation of drain impeller 76, as shown in FIG. 5, causes a clockwise flow of wash liquid within drain pump chamber 71.

Pressure created by wash liquid flow within drain pump chamber 71 causes ball check valve 60 to rise from a resting position on ball check valve support 67 to a seated position on the bottom side of soil container drain port 58, as shown in FIG. 3. When so positioned, ball check valve 60 prevents flow of accumulated soil particles and wash liquid therethrough. Check valve 89 located in line with and downstream of drain port 78 prevents air from entering drain port 78 during operation of drain impeller 76 in a clockwise direction.

Since the soil collection chamber 54 is exposed to atmospheric pressure, cleansed wash liquid quickly flows through fine mesh filter segments 32 and is returned to circulation within dishwasher space 14, to be continuously recirculated along with wash liquid emitted from upwardly directed nozzles 24 and downwardly directed nozzles 26. Accordingly, fine mesh filter segments 32, in combination with downwardly directed nozzles 26 and upwardly directed nozzles 24, achieve a high flow rate of wash liquid through soil separator 20. The high flow rate through soil separator 20 increases its effectiveness, since during a single wash cycle, the wash liquid passes through soil separator 20 a higher number of times, increasing the likelihood a particular soil particle will be removed from circulation.

Upon completion of a wash or a rinse cycle, a drain cycle is initiated. At that time, pump motor 17 is reversed, causing drain impeller 76 to rotate in a counterclockwise direction, as viewed in FIG. 5. Drain impeller 76 causes negative pressure to be applied within conduit 69, which causes ball check valve 60 to fall away from soil container drain port 58. Soil-laden water and accumulated soil within soil container chamber 54 is rapidly pumped out by drain impeller 76, and expelled through drain port 78. In addition, drain impeller 76 is further in fluid connection with floor 11. Wash or rinse liquid draining from soil separator 20 accumulates on base plate 65, and is pumped out through drain port 78 along with liquid from floor 11. Accordingly, when operated in a counterclockwise direction, drain impeller 76 rapidly and effectively drains soil separator 20.

As is apparent from the foregoing specification, the invention is susceptible of being embodied with various alterations and modifications which may differ particularly from those that have been described in the preceding specification and description. It

should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

Claims

1. In a dishwasher having a wash cavity, a circulation pump operable in a wash mode and a drain mode comprising:
 - a first upstanding annular wall defining a pump chamber;
 - a centrifugal pump impeller in said pump chamber for discharging wash liquid from said pump chamber;
 - means for conducting a first portion of said wash liquid to a wash arm device within said wash cavity;
 - a second wall disposed outwardly of said first upstanding annular wall and defining therebetween a guide chamber;
 - said guide chamber being fluidly connecting to said pump chamber for receiving a second soil-laden portion of the discharged wash liquid from said pump chamber;
 - said second wall further including an aperture permitting said soil-laden portion of the wash liquid to flow from said guide chamber;
 - a third wall defining a soil container, said soil container being fluidly connected to said guide chamber by said aperture in said second wall;
 - filter means disposed in said third wall for filtering soil particles from said soil-laden portion of said wash liquid;
 - means for returning cleansed liquid to said pump chamber to be circulated with additional wash liquid delivered thereto when said circulation pump is operated in a wash mode; and
 - means for draining accumulated soil from said soil container means when said circulation pump is operated in a drain mode.
2. The circulation pump as described in Claim 1, wherein said second wall comprises an annular wall disposed substantially circumjacent said first annular wall.
3. The circulation pump as described in Claim 2, wherein said first annular wall includes an upper edge defining the upper limit of the wall around the entire perimeter of said wall, said upper edge being exposed along its entire length to said guide chamber.
4. The circulation pump as described in Claim 2, wherein said third wall comprises an annular wall

disposed substantially circumjacent said second annular wall.

5. The circulation pump as described in Claim 1, wherein said aperture is disposed in a lower portion of said second wall.
6. The circulation pump as described in Claim 1, wherein said filter means comprises a fine mesh screen having an aperture size no greater on average than .0106".
7. The circulation pump as described in Claim 1, wherein said soil container is maintained at substantially atmospheric pressure.
8. The circulation pump as described in Claim 1, wherein said means for draining accumulated soil from said soil collector comprises an opening disposed in said soil collector, said opening selectively closeable by a ball check valve blocking said opening.
9. The circulation pump as described in Claim 5, wherein said ball check valve unseats from said opening during operation of the pump in a drain mode, whereby accumulated soil and soil-entrained wash fluid collected in said soil collector is permitted to pass through said opening.
10. A combination wash pump and soil separator for a dishwasher comprising:
 - a motor;
 - a wash pump impeller driven by said motor for circulating wash liquid;
 - a first annular wall defining a pump chamber, said wash impeller being disposed within said pump chamber;
 - a second annular wall disposed circumjacent said first annular wall defining a guide chamber;
 - said guide chamber being fluidly connected to said wash liquid circulated by said wash pump impeller for receiving a soil-laden portion of the wash liquid from said pump chamber;
 - a third annular wall disposed circumjacent said second annular wall defining a soil container, said soil container being in fluid connection with said guide chamber and having an internal pressure approximately equal to atmospheric pressure;
 - means in said soil container for collecting non-floating soil material from said soil-laden portion of the wash liquid;
 - filter means in said soil container for filtering said soil-laden water of non-settling soil particles, maintaining said non-floating and said non-settling particles within said soil container

- chamber, and emitting cleansed liquid;
 means for returning the cleansed liquid to
 said pump chamber to be discharged with addi-
 tional wash liquid delivered thereto; and
 means for draining accumulated soil from
 said soil container. 5
11. The combination wash pump and soil separator
 of Claim 10 wherein said motor is a reversible mo-
 tor, operable in a first wash mode and a second
 drain mode. 10
12. The combination wash pump and soil separator
 of Claim 11 further including a drain impeller. 15
13. The combination wash pump and soil separator
 of Claim 12, wherein said means for draining ac-
 cumulated soil from said soil collector comprises
 an opening disposed in said soil collector, said
 opening selectively closeable by a ball check
 valve blocking said opening. 20
14. The combination wash pump and soil separator
 of Claim 13, wherein said drain impeller operates
 to provide fluid pressure to the ball check valve
 when said motor is operated in a wash mode,
 thereby causing said ball check valve to effec-
 tively block said opening. 25
15. The circulation pump as described in Claim 14,
 wherein said drain impeller operates to provide
 fluid suction to the ball check valve when said
 motor is operated in a drain mode, thereby caus-
 ing said ball check valve to unseat from said
 opening, permitting accumulated soil and soil-
 entrained wash fluid collected in said soil collec-
 tor to pass through said opening. 30
 35
16. In a dishwasher structure having a wash arm de-
 vice, centrifugal pump means, and means for
 conducting to said wash arm device liquid centri-
 fugally pumped by said pump means, the im-
 provement comprising:
 first annular wall means defining a pump
 chamber, said centrifugal pump means being ar-
 ranged in said pump chamber to pump wash liq-
 uid through said pump chamber to said conduct-
 ing means and to impart centrifugal force to soil
 particles contained in said wash liquid thereby
 causing soil particles to be at least partially con-
 centrated adjacent said first annular wall means;
 means defining a soil container for collect-
 ing non-floating soil particles from the wash liq-
 uid to provide a cleansed liquid;
 guide means for conducting a portion of
 said wash liquid containing said concentrated soil
 particles from said pump chamber to said soil
 container; 40
 45
 50
 55
- filter means disposed in said soil collector
 for filtering non-settling soils from said soil laden
 portion, and providing a cleansed liquid;
 means for returning said cleansed liquid to
 said pump chamber to be discharged with addi-
 tional wash liquid delivered thereto.
17. A dishwasher as described in Claim 16, wherein
 said dishwasher includes means for backflushing
 said filter means.
18. A dishwasher as described in Claim 17, wherein
 said backflushing means includes a wash arm
 device having a spray nozzle for directing a por-
 tion of said wash liquid to said filter means for
 clearing said filter means of entrapped soil partic-
 les and permitting flow of cleansed liquid there-
 through.
19. A dishwasher as described in Claim 18, wherein
 a tab is mounted closely adjacent said spray noz-
 zle, causing the wash liquid emitted therefrom to
 form a fan shape for improved backflushing of
 said filter means.

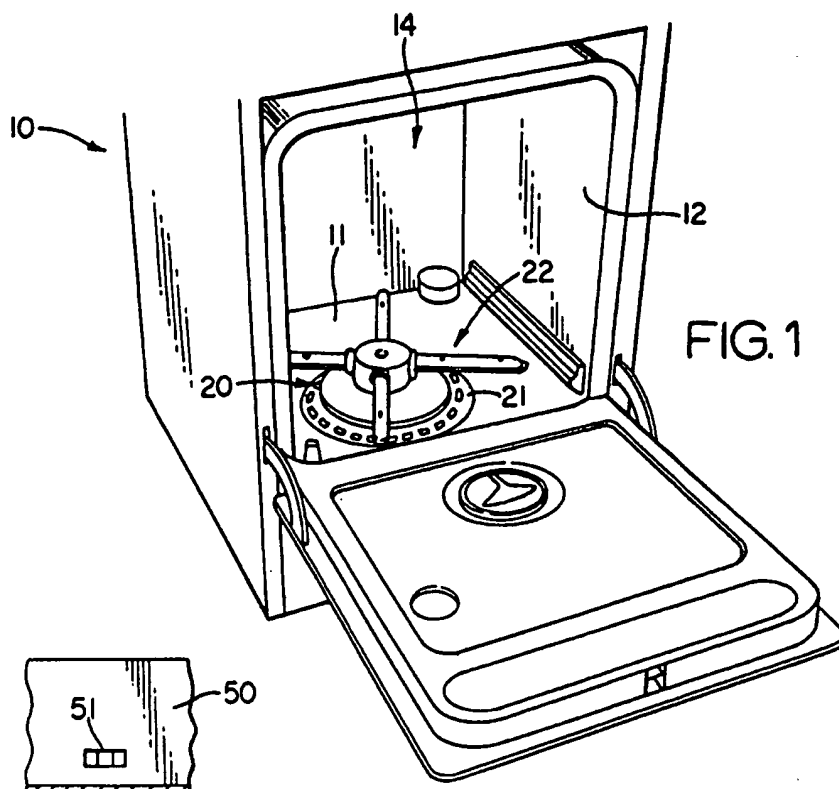
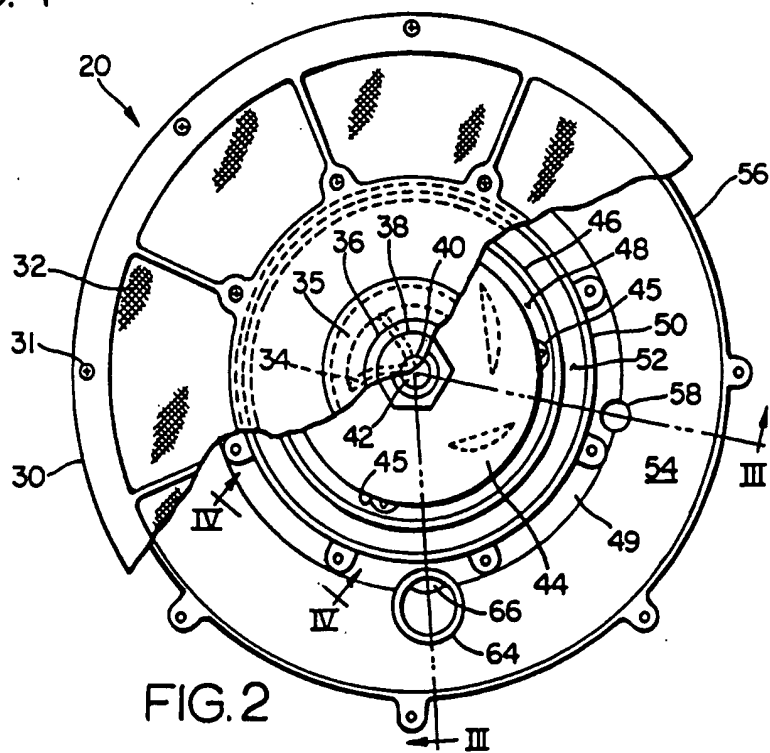


FIG. 4



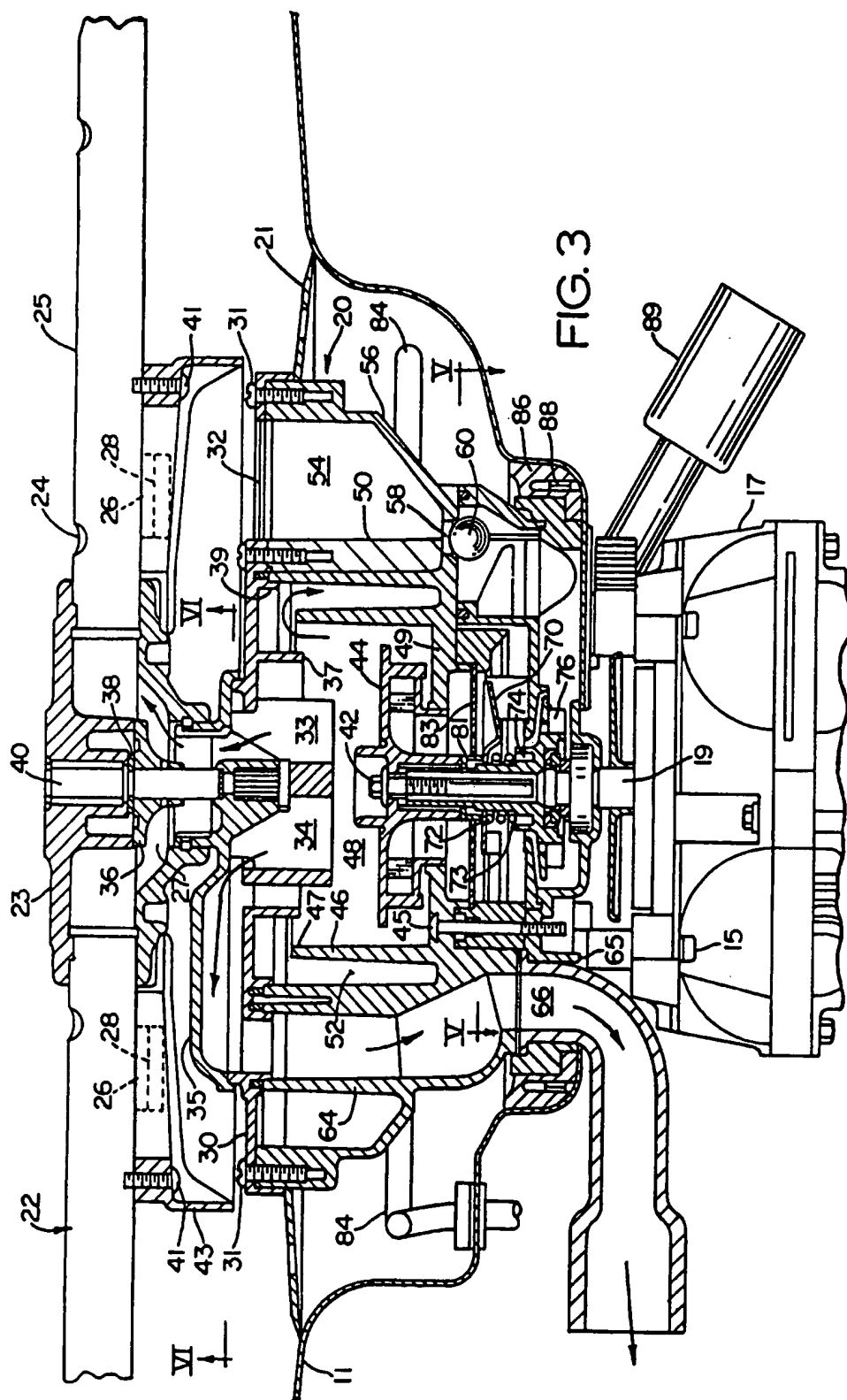
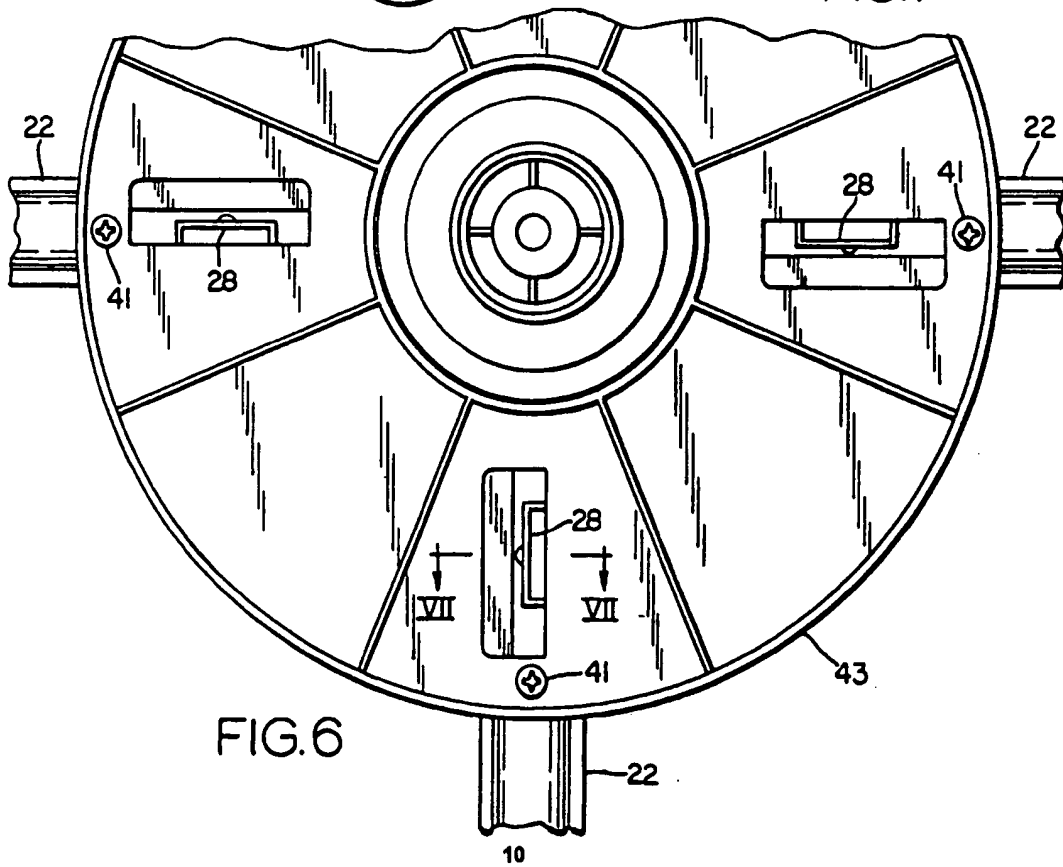
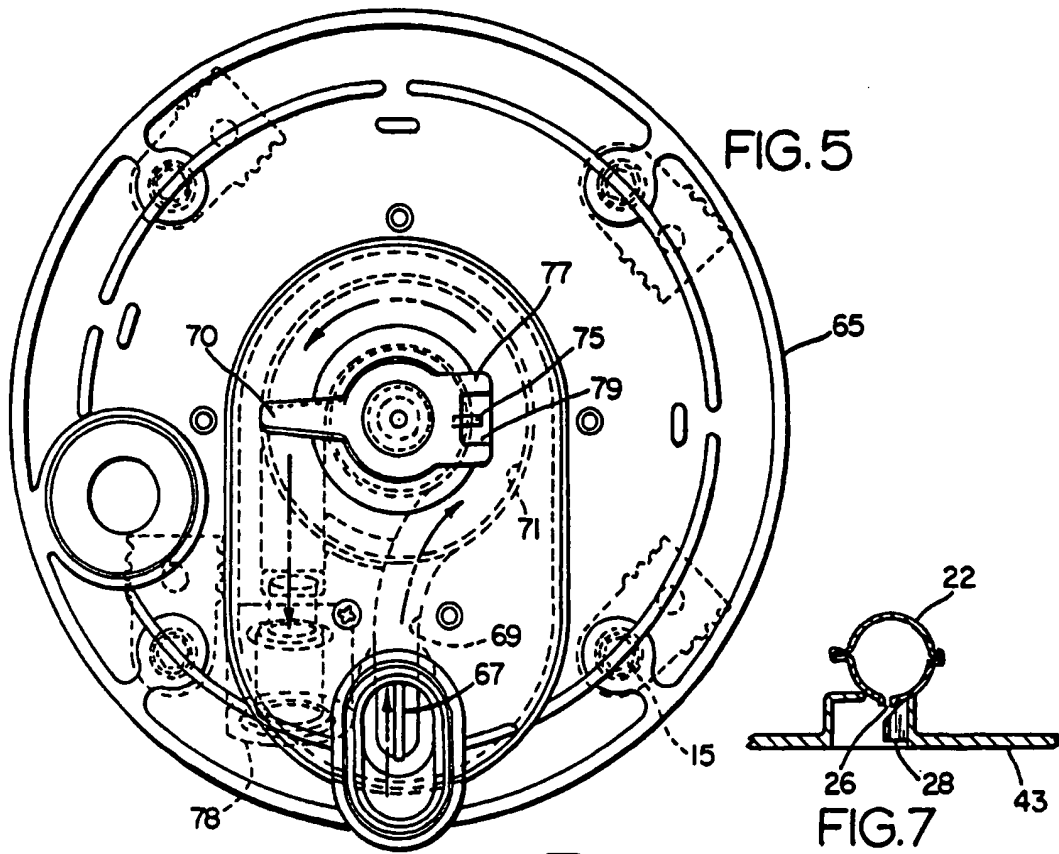


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 7038

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 150 680 (P.P. JOHNSON ET AL.) * the whole document *	1	A47L15/42
D,A	US-A-4 319 599 (G.L. DINGLER ET AL.) * the whole document *	1	
A	US-A-4 319 598 (G.L. DINGLER ET AL.) * claims 1-19 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 NOVEMBER 1992	Examiner KELLNER M.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 150 (3.92 (P0401))